

REMARKS

Applicants are amending the claims herein to better claim the present invention and to correct informalities in the claims.

Applicants will address each of the Examiner's objections and rejections in the order in which they appear in the Final Rejection.

Claim Rejections – 35 USC §112

In the Final Rejection, the Examiner rejects Claims 41-71 under 35 USC §112, first paragraph, as failing to comply with the written description requirement. This rejection is respectfully traversed.

More specifically, the Examiner objects to the feature of wherein the concentration of oxygen, nitrogen, and hydrogen throughout the thickness of said hydrogenated silicon oxynitride film is from 55 to 70 atomic%, from 0.1 to 6 atomic%, and from 0.1 to 3 atomic%, respectively, in the claimed invention and contends that the underlined portion is not found in the text or drawings. Applicants respectfully disagree with the Examiner's rejection.

Initially, it cannot be disputed that the claimed ranges are recited in the specification as filed. See e.g. page 4, lns. 22-26; page 12, lns. 24-28; original claim 1, etc. Hence, it appears that the Examiner's objection is that the words "throughout the thickness of said hydrogenated silicon oxynitride film" are not specifically recited in the specification.

It is not necessary for these words to be specifically recited in the application. Claims and patent applications are drafted for one of ordinary skill in the art. It is respectfully submitted that one of ordinary skill in the art would understand this feature from the application as filed. In particular, the Background of the Invention of the specification discusses developing a thin-film transistor

(TFT) and problems with the manufacture of insulating films, such as gate insulating films, while producing TFTs. Page 2, lns. 22-24 state that “In order to form a good quality insulating film, it is essential not to introduce any defects in the film deposition process, and to use a composition which reduces the defect level density of the formed film.” The specification then discusses prior methods which have not produced such good results during manufacturing.

Accordingly, the “Summary of the Invention” in the specification states that “an object of the present invention is therefore to provide an insulating film suitable for a semiconductor device, typically a TFT, and a method of manufacturing the same.” Page 3, lns. 23-25. As explained on page 4, lns. 1-5 and 22-26, in order to solve the problems discussed in the Background and to achieve the object of the present invention, the insulating film material of the present invention has the claimed compounds and claimed ranges. As explained on page 5, lns. 20-21, the “inclusion of excess hydrogen brings about the result of an increase in the instability of the film, as stated above.”

Hence, it is clear from the present application that the composition of the gate insulating film in the claimed range is not the subject of a portion of the gate insulating film but throughout the thickness of the gate insulating film. One of ordinary skill in the art would clearly understand this upon reading the application.

Further, since the insulating film is formed by a predetermined flow rate ratio, i.e. “introducing SiH_4 into the reaction chamber at 8.4 Pa·l/sec, N_2O at 203 Pa·l/sec, and H_2 at 211 Pa·l/sec” (page 17, 20-21), and that “The respective gas flow rates are not limited to these absolute values, but rather their flow rate ratios essentially are more significant” (page 10, ln. 4-6), the concentration of the gate insulating film does not deviate from the claimed range.

Therefore, it is respectfully submitted that this claimed feature is clearly supported by the application as filed. Accordingly, it is respectfully requested that this rejection be withdrawn.

Claim Rejections - 35 USC §103

Claims 41-44, 45, 48, 51, 54 and 57-61

The Examiner also rejects Claims 41, 44, 45, 48, 51, 54 and 57-61 under 35 USC §103(a) as being unpatentable over Miyazaki et al. (US 5,804,878) in view of Yamazaki et al. (JP408055847A - for which Yamazaki et al. (US 5,970,384) serves as translation). This rejection is respectfully traversed.

More specifically, the Examiner admits that Miyazaki does not disclose or suggest the limitation in the last three lines of independent Claim 41 (and similarly in the other independent claims). The Examiner, however, contends that it would have been obvious to include this limitation in view of Yamazaki.

In support of this contention, the Examiner asserts that the single Si-H and Si-OH bonds are substantially due to water penetration and hence occur in substantially equal abundance, which as both H are replaced by nitrogen bonds implies a reduction by substantially half the amount of N introduced, i.e., substantially less than $6/2 = 3$ atomic% H. Applicants respectfully submit that this explanation by the Examiner is insufficient to support a prima facie case of obviousness.

For example, the Examiner does not explain the reason why both H can reduce to substantially half the amount of N introduced so there is no evidence that H concentration is substantially less than $6/2 = 3$ atomic% H.

Further, Yamazaki states that “the Si-H and Si-OH bonds which are easily broken by hot carriers at the boundary between the gate insulating film and the active layer are converted to $\text{Si}_2\equiv\text{SN}$ bonds and $\text{Si}_2=\text{N-O}$ bonds.” Col. 7, Ins. 17-21 in Yamazaki. Therefore, since Yamazaki does not disclose or suggest both H are replaced by nitrogen bonds throughout the gate insulating film, there is no evidence that the H concentration is substantially less than $6/2 = 3$ atomic %H throughout the

gate insulating film.

Accordingly, the cited references do not disclose or suggest the claimed invention, and no prima facie case of obviousness has been established. Therefore, the claims are patentable over the references, and it is respectfully requested that this rejection be withdrawn.

Claims 42, 46, 49, 52 and 55

The Examiner also rejects Claims 42, 46, 49, 52 and 55 under 35 USC §103(a) as being unpatentable over Miyazaki et al. and Yamazaki et al., further in view of Patent Document owned by Sharp KK (Publication NO. JP 11101974 A). This rejection is also respectfully traversed.

Each of these claims is a dependent claim. Therefore, for at least the reasons discussed above for the independent claims, these claims are also allowable over the cited references. Accordingly, it is respectfully requested that this rejection be withdrawn.

Claims 43, 47, 50, 53 and 56

The Examiner also rejects Claims 43, 47, 50, 53 and 56 under 35 USC §103(a) as being unpatentable over Miyazaki et al. and Yamazaki et al., further in view of Tang (US 5,684,365). This rejection is also respectfully traversed.

Each of these claims is a dependent claim. Therefore, for at least the reasons discussed above for the independent claims, these claims are also allowable over the cited references. Accordingly, it is respectfully requested that this rejection be withdrawn.

Claims 62-66

The Examiner also rejects Claims 62-66 under 35 USC §103(a) as being unpatentable over Miyazaki et al. and Yamazaki et al., further in view of Yamazaki (US 5,784,073 - Yamazaki 2). This rejection is also respectfully traversed.

Each of these claims is a dependent claim. Therefore, for at least the reasons discussed above for the independent claims, these claims are also allowable over the cited references. Accordingly, it is respectfully requested that this rejection be withdrawn.

Double Patenting

The Examiner also objects to Claims 51-56 under 37 C.F.R. §1.75 and contends that Claim 51 is a substantial duplicate of Claim 45, Claim 52 is a substantial duplicate of Claim 46, Claim 53 is a substantial duplicate of Claim 47, Claim 54 is a substantial duplicate of Claim 48, Claim 55 is a substantial duplicate of Claim 49, and Claim 56 is a substantial duplicate of Claim 50. Applicants also respectfully traverse this rejection.

While Applicants traverse this rejection, in order to advance the prosecution of this application, Applicants are amending independent Claims 51 and 54 to recite, for example, “a first base insulating film on said substrate,” and “a second base insulating film on said first base insulating film.” These features are shown, for example, on page 13, lns. 16-18 and Fig. 1A of the application as filed.

Hence, amended Claims 51-56 are not a substantial duplicate of Claims 45-50. Accordingly, it is respectfully requested that this rejection be withdrawn.

Applicants are submitting an information disclosure statement (IDS) herewith. It is respectfully requested that this IDS be entered and considered prior to the issuance of any further action for this application.

Conclusion


It is respectfully submitted that the present application is in a condition for allowance and should be allowed.

Please charge our Deposit Account No. 50-1039 for any fee due for this amendment.

Favorable reconsideration is earnestly solicited.

Respectfully submitted,

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